Wastewater Lagoon Operation & Maintenance

Mike McBride
Wastewater Operator Certification Program
June 9, 2021

Housekeeping

- All participants are muted.
- This event will be recorded and available on **http://dee.ne.gov/**
  - Type in “Video Events” (without quotes) in the search bar.
- If you are having audio issues when connecting via computer, please call in via phone at: 1-415-655-0003 access code: 145 799 1682

Questions

- Please feel free to submit questions in chat throughout the presentation. They will be answered (in order received) during specified breaks during, and following the presentation.
- We can stay on longer than the originally scheduled end time to answer questions.
- An FAQ document will be uploaded to the video events page.

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Presentation Overview

- **Lagoon Introduction**
- **Types of Lagoons**
  - ❖ **Aerated**
  - ❖ **Anaerobic**
  - ❖ **Facultative**

- **Facultative Lagoons**
  - ❖ **Lagoon Biology**
  - ❖ **How they work**
  - ❖ **Regulatory Compliance**
  - ❖ **Safety**

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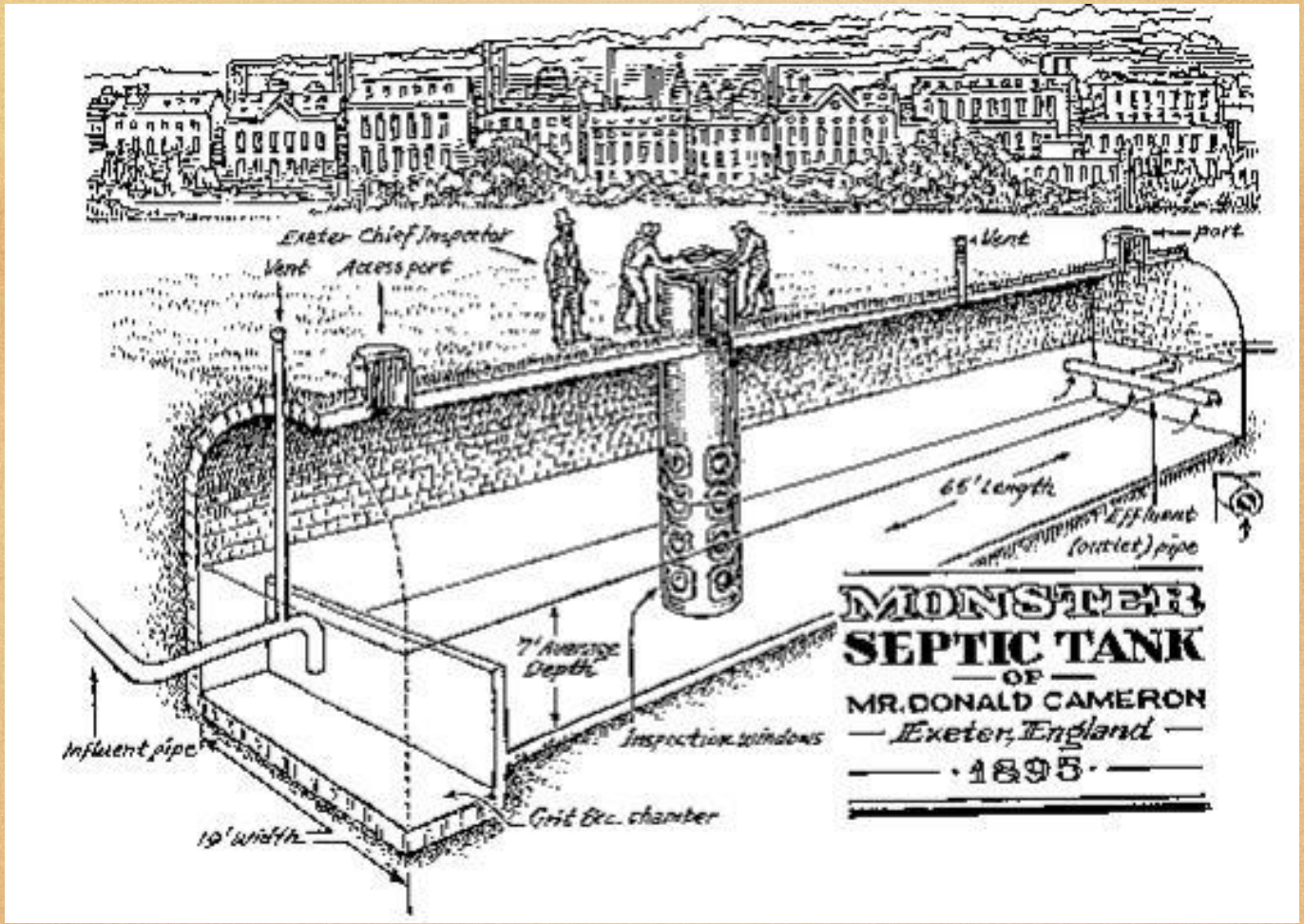
Lagoons: Introduction

Early Sewage Management

- 5000 Years Ago: Latrines, Scotland archipelago
- Europe & Asia



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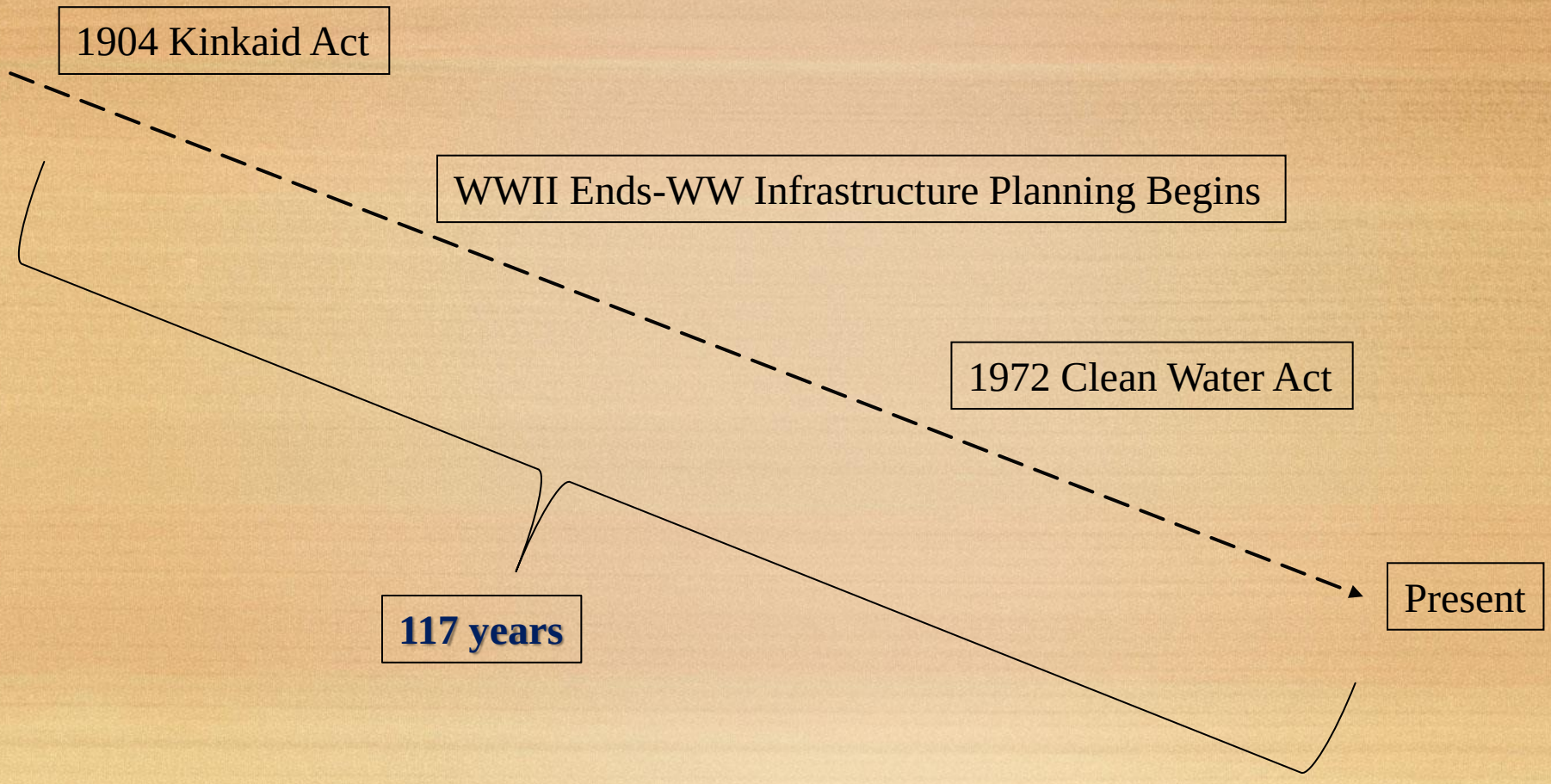
…and that special summer stench so familiar to any St. Petersburger who can't afford a cottage in the country...

crime and punishment, ch. 1. f. dostoevsky. 1866.



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TREATMENT PLANT OPERATOR

tpo™

News Briefs: Montana Resort to Recycle Wastewater for Snow on Ski Runs

Look how far we have come today

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Treatment Lagoons

- Aerated
- Anaerobic
- **Facultative**

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Aerated Lagoons

https://www.google.com/url?sa=i&url=http%3A%2F%2Fwww.lagoonsonline.com%2Ftrouble-shooting-wastewater-lagoons.htm&psig=AOvVaw3F_gMiT3cXuPPwnoHXM4qR&ust=1622057941494000&source=images&cd=vfe&ved=2ahUKEwi1nsTsyuXwAhURoawKHdVgBU4Qr4kDegUIARDYAQ.

https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.wateronline.com%2Fdoc%2Feliminating-sludge-islands-in-your-wastewater-lagoon

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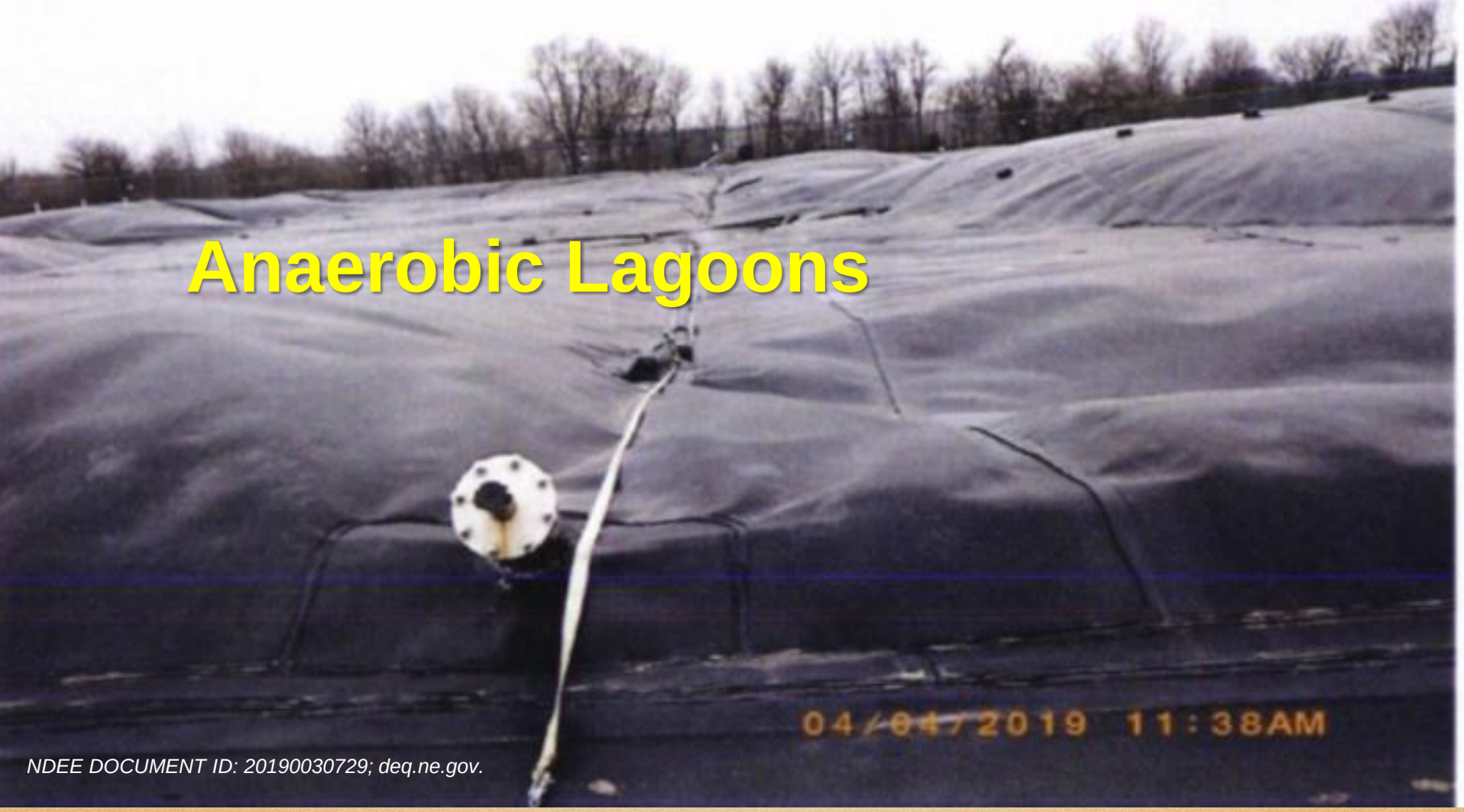
Anaerobic Lagoons



NDEE DOCUMENT ID: 20190030729; deq.ne.gov.

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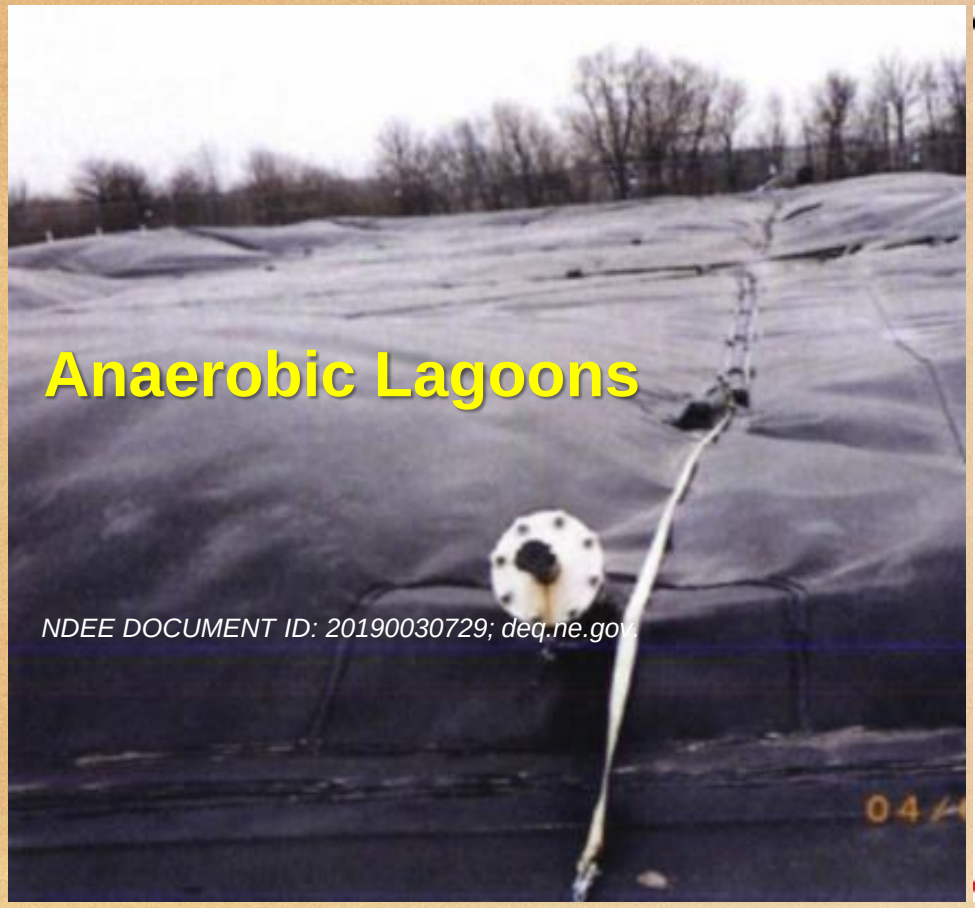

Anaerobic Bacteria

Do not require Oxygen for Growth.

Obligate Anaerobic Bacteria:
These bacteri can not survive in the presence of oxygen.
Example: *Clostridium tetani, C. perfringens*

Facultative Anaerobic Bacteria:
These Bacteria can grow without oxygen but use oxygen if it is present
Example: *E.coli*

Aerotolerant Bacteria: These bacteria can not use oxygen for their growth but are not harmed by it.

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Facultative Lagoons

- **Controlled Discharge**

- **Complete Retention**

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BREAK

Lagoon Biology

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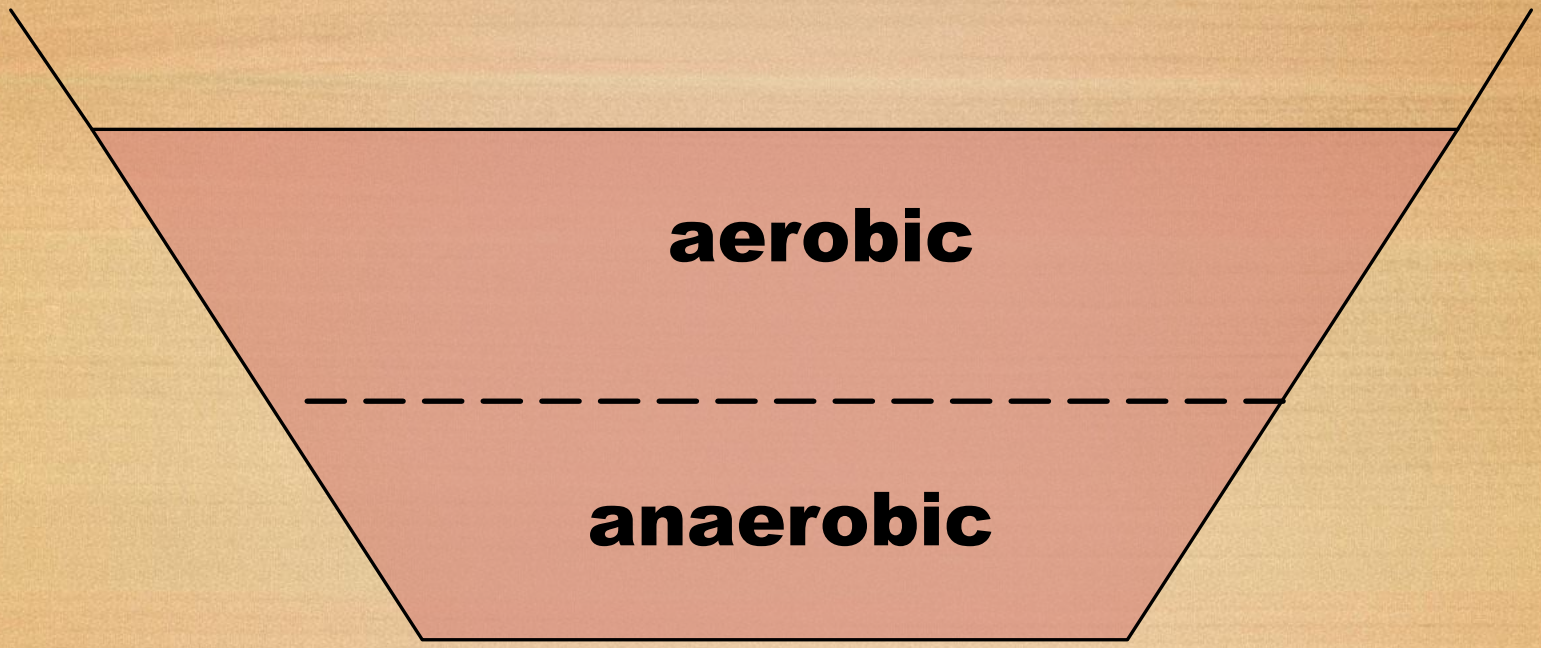
FACULTATIVE LAGOON



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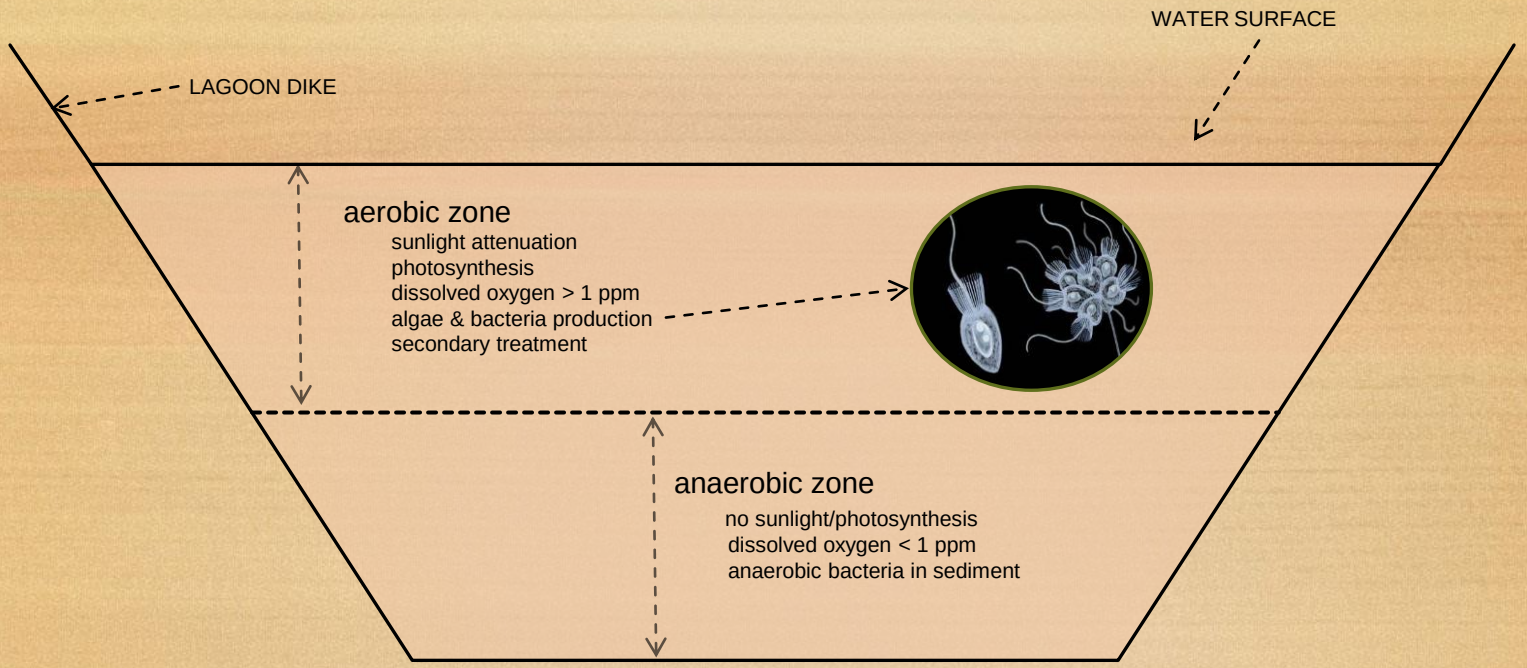
THE FACULTATIVE LAGOON



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THEORY OF OPERATION

- Ponding of wastewater to:
  - Stabilize the waste
  - Cause die-away of pathogens
  - Allow percolation, evaporation or controlled discharge, and land application

- Stabilize: waste that has been treated or decomposed to the extent that if discharged or released, its rate and state of decomposition would be such that the waste would not cause a nuisance or odor.

Lagoons:
How They Work

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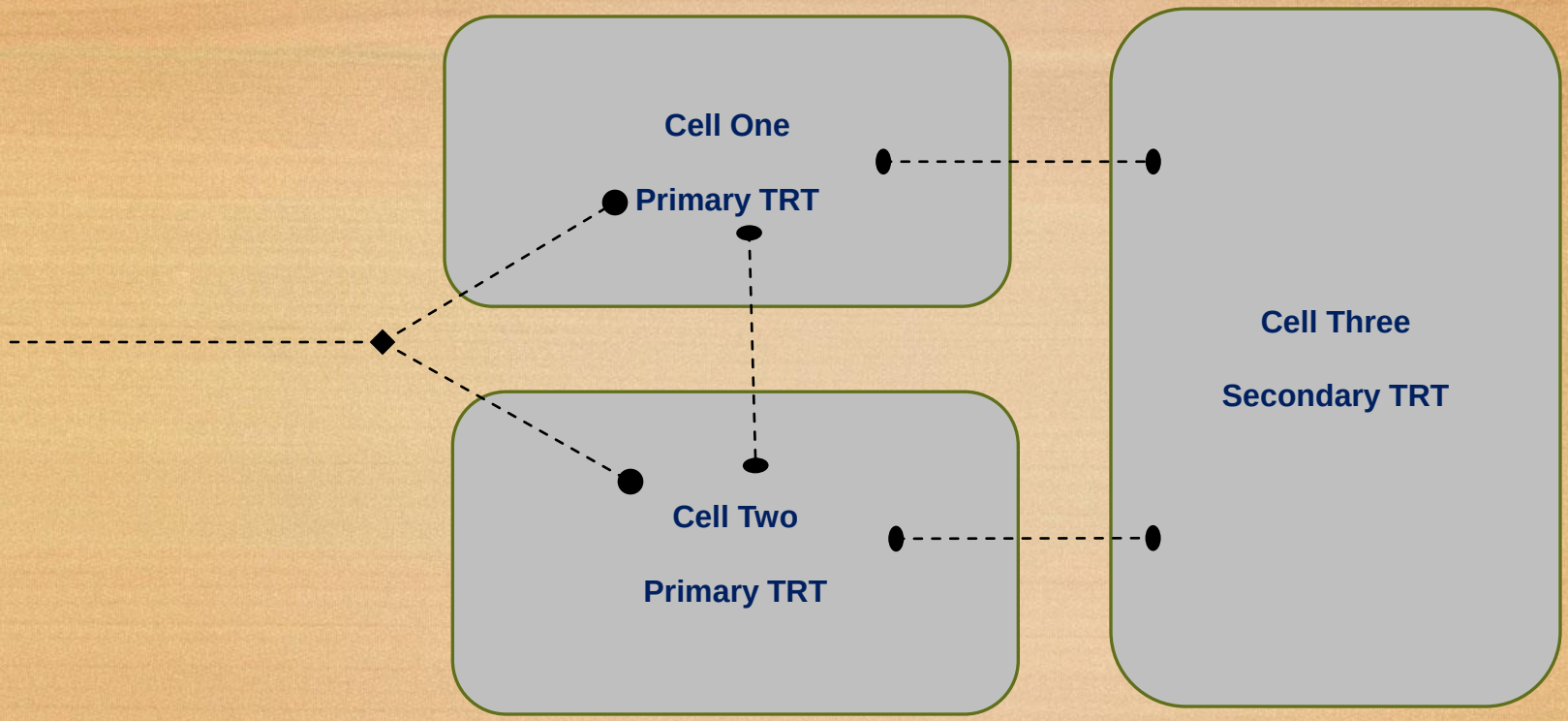
Facultative WW Lagoon



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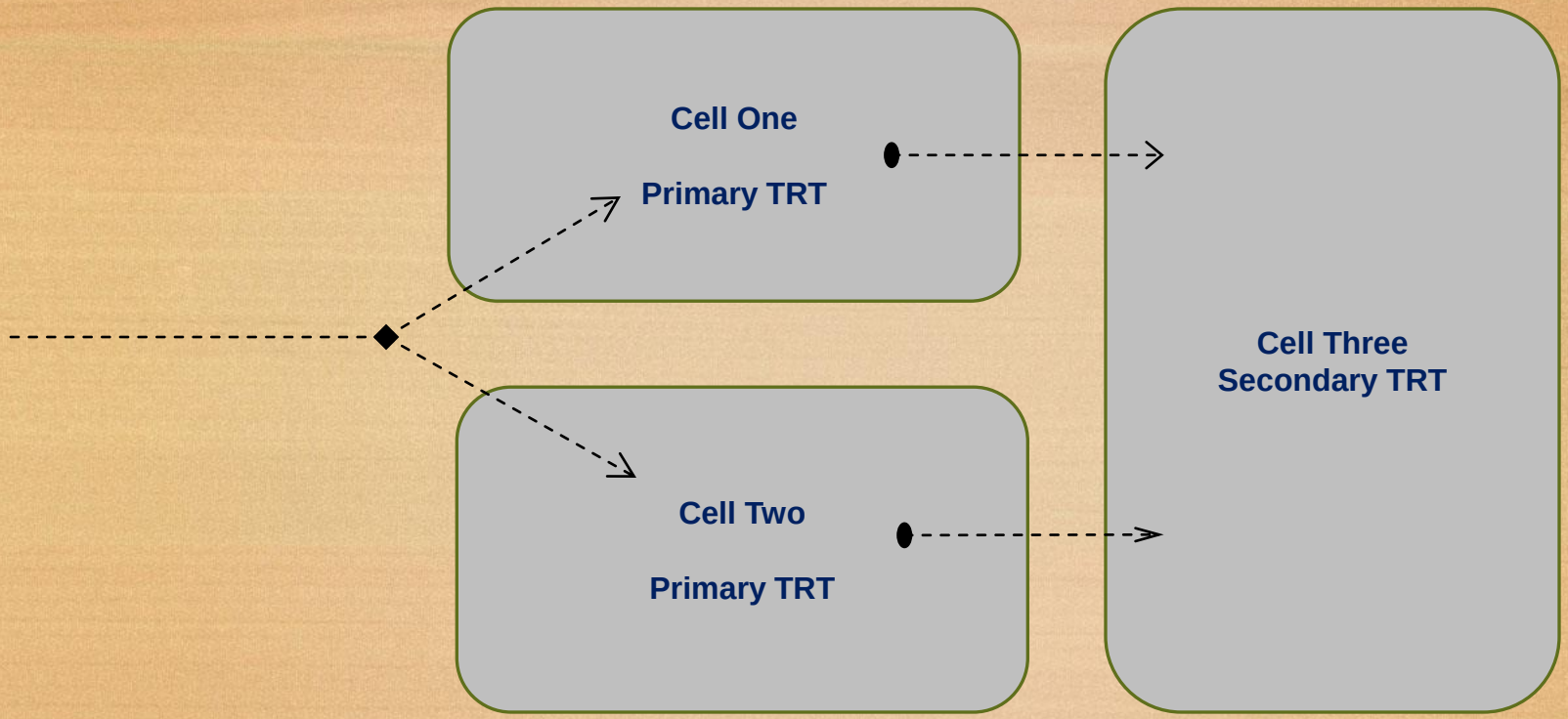
Parallel Operation



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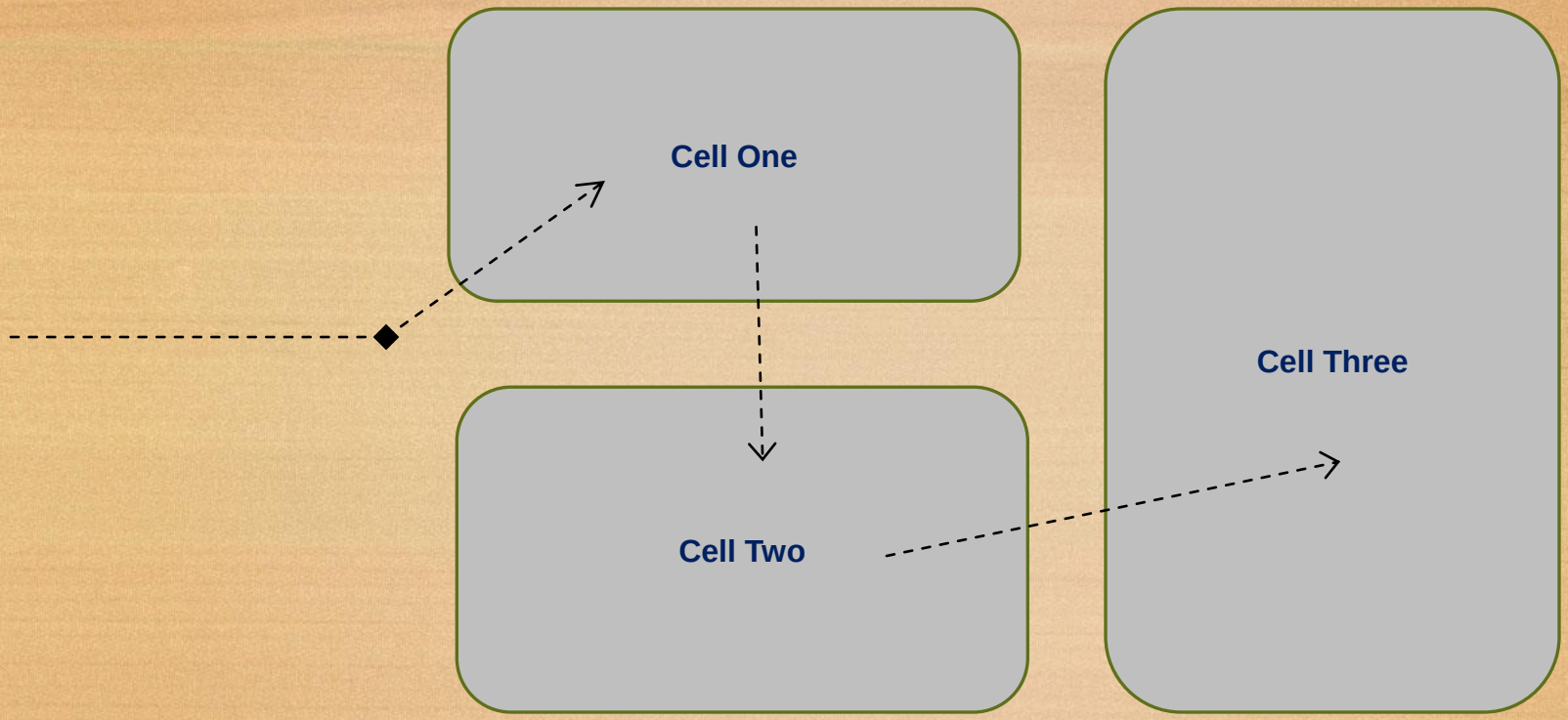
SERIES OPERATION



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- **AERATION**
- **Lagoons need at least 1 – 2 mg/l of dissolved oxygen at all times**
- **Dissolved Oxygen cycles daily due to the influence of algae with highest concentrations occurring in the late afternoon and the lowest concentrations occurring in the early morning around daybreak.**
- **Best time to sample for minimum amount of dissolved oxygen is in very early morning.**

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- **Lagoon Color**
  - **Indicate condition of lagoon**
  - **Green is Good**
  - **Dark Sparkling Green- good, can be associated with high pH and Dissolved Oxygen.**
  - **Tan or Brown – OK if caused by algae (diatoms); not good if due to silt or dike erosion**

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- **Milky Appearance - Indicates system is approaching or is septic, typically from organic overloading.**

- **White crispy foam in down wind corners of lagoon cell is good. Means the bacteria are actively breaking down the BOD.**

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- **Odors**

Overloading

Weather

Circulation

Industrial Wastewater

Turnover

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Common Inspection Items

- Groundskeeping
- Vegetation Control
- 2 ft. min. depth
- Rodent control
- Perimeter fence w/ signs

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Be Inspection Ready

1. Know your NPDES Permit
2. Maintain Grounds
3. Lab Reports
4. Records

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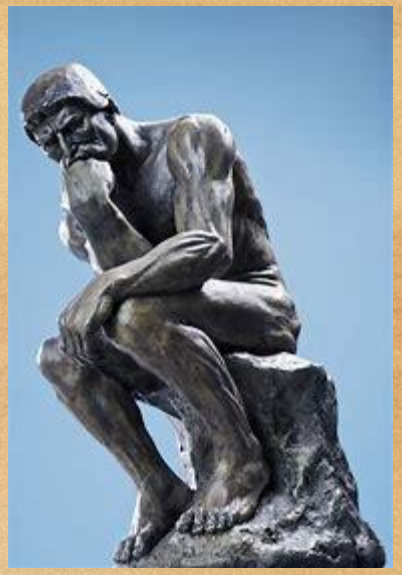
What the OPERATOR/CARETAKER must consider for lagoon systems



- PUBLIC HEALTH
- ENVIRONMENT
- DOWNSTREAM USERS
- ESSENTIAL FOR PROPER TREATMENT
-
- CARETAKER OF LARGE CAPITAL INVESTMENT

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BREAK

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SAFETY

OHSA = Resource

OSHA.COM
Online OSHA Training

OH&S
OCCUPATIONAL HEALTH & SAFETY
89 YEARS

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WW Lagoon Safety

Lockout/Tagout

Confined Space & Dangerous Gases

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Lockout/Tagout

Eight Basic LOTO Steps

1. **Prepare for shutdown**
2. **Notify affected employees**
3. **Shut down the equipment**
4. **Isolate energy sources**
5. **Apply LOTO devices**
6. **Release/control all stored energy**
7. **Verify the lockout**
8. **Maintain the lockout**

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Confined Space

A **confined space** also has limited or restricted means for entry or exit and is not designed for continuous occupancy. **Confined spaces** include, but are not limited to, tanks, vessels, silos, storage bins, hoppers, vaults, pits, manholes, tunnels, equipment housings, ductwork, pipelines, etc. (OSHA).

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Confined Space Dangerous Gases

a) Hydrogen Sulfide

b) Methane

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HOUSEKEEPING

THE END